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PATENT SPECIFICATION

Inventor: JOHN EDWARD SHERLOCK.

653,608

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PROVISIONAL SPECIFICATION

Improvements in or relating to Shaft Seals

We, THE BRITISH THERMOSTAT COMPANY LIMITED, a British Company, of Teddington Works, Windmill Road, Sunbury-on-Thames, Middlesex, do hereby declare the nature of this invention to be as follows:—

This invention relates to shaft seals or packless glands of the kind wherein an annular ring rotatable with a shaft makes rubbing contact with a fixed ring, the engagement between these two components being maintained by resilient means. In shaft seals of this character the said resilient means are frequently constituted by a flexible corrugated metallic sleeve or bellows which also forms a sealing component. It is the object of the present invention to provide improvements in the construction of shaft seals designed to constitute safety means to prevent serious leakage of liquid in the event of the metallic sleeve becoming punctured or broken, and also to provide a means of damping out vibration at the seal face.

According to the invention an improved shaft seal or packless gland of the kind above described is characterised by a resilient ring carried directly or indirectly by the shaft and making contact with a complementary part of the device in a position to prevent leakage along the shaft to the exterior of the gland.

In carrying the invention into effect and according to one form thereof a shaft seal is constituted by an annular plate fixed around a shaft and connected by a flexible metallic bellows to an annular ring formed integral with a cylindrical housing which extends into a position closely adjacent the periphery of the annular plate. At the junction between annular ring and housing a recess is formed in which is seated the seal ring which in operation rotates in contact with the rubbing ring fixed to the stationary housing. In order to prevent leakage of liquid in the event of puncture or fracture of the bellows, the peripheral portion of the said annular plate is formed or provided with an annular bracket forming a channel-shaped groove in which is disposed a ring of resilient material which, where oil is the liquid liable to leak, is formed from synthetic rubber.

According to another form of the invention the resilient ring is disposed in a peripheral groove formed in the ring freely surrounding the shaft which carries the sealing ring, this ring being mounted at the free end of the flexible metallic bellows whose opposite end, as before, is fixed to an annular plate carried by the shaft.

In either form of construction above described the resilient ring operates, in the event of puncture or fracture of the metallic bellows, to prevent leakage of liquid to the exterior of the bearing in which the shaft is rotatable.

According to another form of the invention the resilient ring is disposed in a peripheral groove formed in the seal ring which is mounted so as freely to surround the shaft. The seal ring is mounted at the free end of a flexible metallic bellows disposed concentrically around the shaft and fixed at its opposite end to an annular plate also freely surrounding the shaft and which is fixed to the housing or other component in which the shaft is supported. The resilient ring completes its seal by making contact with a cylindrical bore machined in the housing or the like. The seal ring bears against the rubbing ring which is fixed to and rotates with the shaft. In operation the resilient ring gives support to the seal ring and so damps out vibration.

Dated this 30th day of December, 1948.

HERON, ROGERS & CO.,
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London, E.C.4.

[Pri

COMPLETE SPECIFICATION

Improvements in or relating to Shaft Seals

We, THE BRITISH THERMOSTAT COMPANY LIMITED, a British Company, of Teddington Works, Windmill Road, Sunbury-on-Thames, Middlesex, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to shaft seals or packless glands of the kind wherein an annular ring carried by the shaft makes rubbing contact with a fixed ring, the engagement between these two components being maintained by resilient means. In shaft seals of this character the said resilient means are frequently constituted by a flexible metallic bellows which also forms a sealing component between its anchorage and the ring component to which it is connected. It is the object of the present invention to provide improvements in the construction of shaft seals designed to avoid serious leakage of liquid in the event of the bellows becoming punctured and also a means of damping out vibration at the seal face.

According to the invention an improved shaft seal is provided comprising an annular ring supported by and rotating with the rotatable shaft and a non-rotatable ring supported by the shaft housing, one of said rings being urged axially into rubbing contact with the other and being sealed to its support member by a flexible bellows, characterised in that a further sealing means co-operates with a member carried by one end of said flexible bellows for the purpose of preventing leakage of liquid in the event of failure of the bellows.

In order that the present invention shall be fully understood two preferred embodiments thereof will now be described with reference to the accompanying drawings wherein:—

Fig. 1 is a sectional elevation of one preferred embodiment, and

Fig. 2 is a sectional elevation of an alternative embodiment.

It is to be understood that only those components necessary for a full understanding of the invention have been illustrated in the accompanying drawings.

As shown in Fig. 1, a shaft 1 rotatably mounted in a housing 2 has fixedly secured thereon an annular rubbing ring 3. To an end wall 4 of the said housing is secured by means of bolts 5 an annular plate 6 the inner edge of which lies concentric with, yet spaced from, the said rotatable shaft 1. To the internal face 7 of this end plate 6 is secured a flexible metallic bellows 8 whose free axially movable end 9 carries an annular sealing ring 10 which latter is urged under the tension of the bellows into rubbing contact with the annular rubbing ring 3 mounted on the shaft. Thus in addition to serving as a resilient means whereby the axially movable sealing ring 10 is urged into rubbing contact with the rotatable rubbing ring 3, the bellows provides an axially expandable sealing member between the ring 10 and its supporting end plate 6 carried by the housing. In order to prevent a serious leakage of liquid from a chamber 11 in the shaft housing, between the axially movable ring 10 and its supporting end plate 6 in the event of the bellows becoming punctured, an additional sealing means is provided between the outer periphery of this sealing ring and the housing. As shown in Fig. 1 this additional sealing means consists of an annulus 12 of resilient material carried in a recess 13 formed around the outer peripheral edge of the sealing ring 10, this annulus being pressed into contact with the machined surface of an axial bore 14 in the shaft housing 2 so as normally to prevent leakage therepast of liquid from the chamber 11 into contact with the outer surface of the bellows. Where oil is the liquid to be confined by the shaft seal it is preferable to employ an annulus formed from synthetic rubber.

In an alternative embodiment of the invention illustrated in Fig. 2 a rotatable shaft 15 is mounted in a housing 16 to an end wall 17 of which is secured by means of bolts 18 an annular end plate 19 the inner edge of which lies concentric with, yet spaced from, the shaft 15. Fixedly secured against a shoulder 20 of the shaft for rotation therewith is an annular plate 21 which is locked in position by means of a sleeve member 22 urged into contact therewith by a lock nut 23 which engages upon a screw-threaded portion 24 of the shaft. To the face of the plate 21 engaged by the sleeve member 22 is anchored one end of a flexible metallic bellows 25 the axially movable end of which has secured thereto an internally directed flange 26 of a cylindrical member 27. To the outer face of the said internally directed flange 26 is secured an annular sealing ring 28 which latter is urged by the axially expandable bellows 25 into rubbing contact

with an internal face 29 of the said annular end plate 19 which constitutes a fixed rubbing ring. In addition to serving as a resilient means the bellows 25 constitutes an axially expandable seal between the sealing ring 28 and its supporting annular plate 21 carried by the shaft. In order to prevent a serious leakage of liquid from the housing chamber 30 in the event of the bellows 25 becoming punctured, an additional sealing means is provided between the outer peripheral edge of the annular plate 21 to which the bellows is anchored and the internal face of the axially movable cylindrical member 27 which carries the sealing ring 28. This additional sealing means consists of an annulus 31 of resilient material retained in a channel formed around the outer periphery of the annular plate 21 by a flanged member 32, this annulus being pressed into contact with the said internal face of the axially movable cylindrical member so as to prevent the passage of liquid therepast.

It will be noted that in the embodiment of the invention shown in Fig. 2 the axially movable sealing ring which is supported by a bellows is mounted for rotation with the shaft whereas in the embodiment shown in Fig. 1 the axially movable sealing ring is non-rotatably supported by a bellows secured to the shaft housing.

As will be readily appreciated the annulus 12 shown in Fig. 1 may be adapted to be carried by the housing 2 and be pressed into contact with the outer peripheral face of the axially movable sealing ring 10 without departing from the scope of the present invention. Similarly, the annulus 31 shown in Fig. 2 may be adapted to be carried by the axially movable cylindrical member 27 and to be pressed into contact with the outer peripheral edge of the annular plate 21 or an extension thereof. In addition to providing a sealing means the annulus of resilient material employed in the embodiments of the invention described above serves to prevent vibration of the axially movable sealing ring carried by the bellows. As is common practice in the art the bellows may be provided internally or externally with a spring to increase the tension whereby the rubbing surfaces of the sealing rings are urged into contact.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A shaft seal comprising an annular ring supported by and rotating with the rotatable shaft and a non-rotatable ring supported by the shaft housing, one of said rings being urged axially into rubbing contact with the other and being sealed to its support member by a flexible bellows, characterised in that a further sealing means co-operates with a member carried by one end of said flexible bellows for the purpose of preventing leakage of liquid in the event of failure of the bellows.

2. A shaft seal according to Claim 1 wherein the flexible bellows is anchored at one end to the shaft housing and carries at its free end the said non-rotatable ring which supports the additional sealing means.

3. A shaft seal according to Claim 1 wherein the flexible bellows is anchored to the shaft for rotation and carries at its free end the said axially movable ring forming a sealing ring, the anchorage of said bellows at the end remote from the sealing ring being arranged to support the additional sealing means.

4. A shaft seal according to Claim 1 or 2 wherein said further sealing means consists of an annulus of resilient material retained in an annular recess in the outer peripheral edge of said non-rotatable ring and arranged for engagement with the internal surface of an axial bore provided in said shaft housing.

5. A shaft seal according to Claim 1 wherein said further sealing means consists of an annulus of resilient material carried by said shaft housing and arranged for engagement with the outer peripheral edge of said non-rotatable ring.

6. A shaft seal according to Claim 1 or 3 wherein said further sealing means consists of an annulus of resilient material carried by the outer peripheral edge of a plate fixedly secured to said shaft and providing the anchorage for the said bellows, said annulus being arranged for engagement with the internal surface of a cylindrical extension formed on or secured to said axially movable ring.

7. A shaft seal according to Claim 1 or 3 wherein said further sealing means consists of an annulus of resilient material carried by the internal surface of a cylindrical extension formed on or secured to the axially movable ring, the said annulus being arranged for engagement with the outer edge of a plate fixed to the shaft or a cylindrical extension of said plate.

8. A shaft seal arranged constructed and adapted to operate as described herein with reference to the accompanying drawings.

Dated this 28th day of November, 1949.

HERON, ROGERS & CO.,
Agents for Applicants,
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London, E.C.4.

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Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies, price 2s. per copy; by post 2s. 1d. may be obtained.

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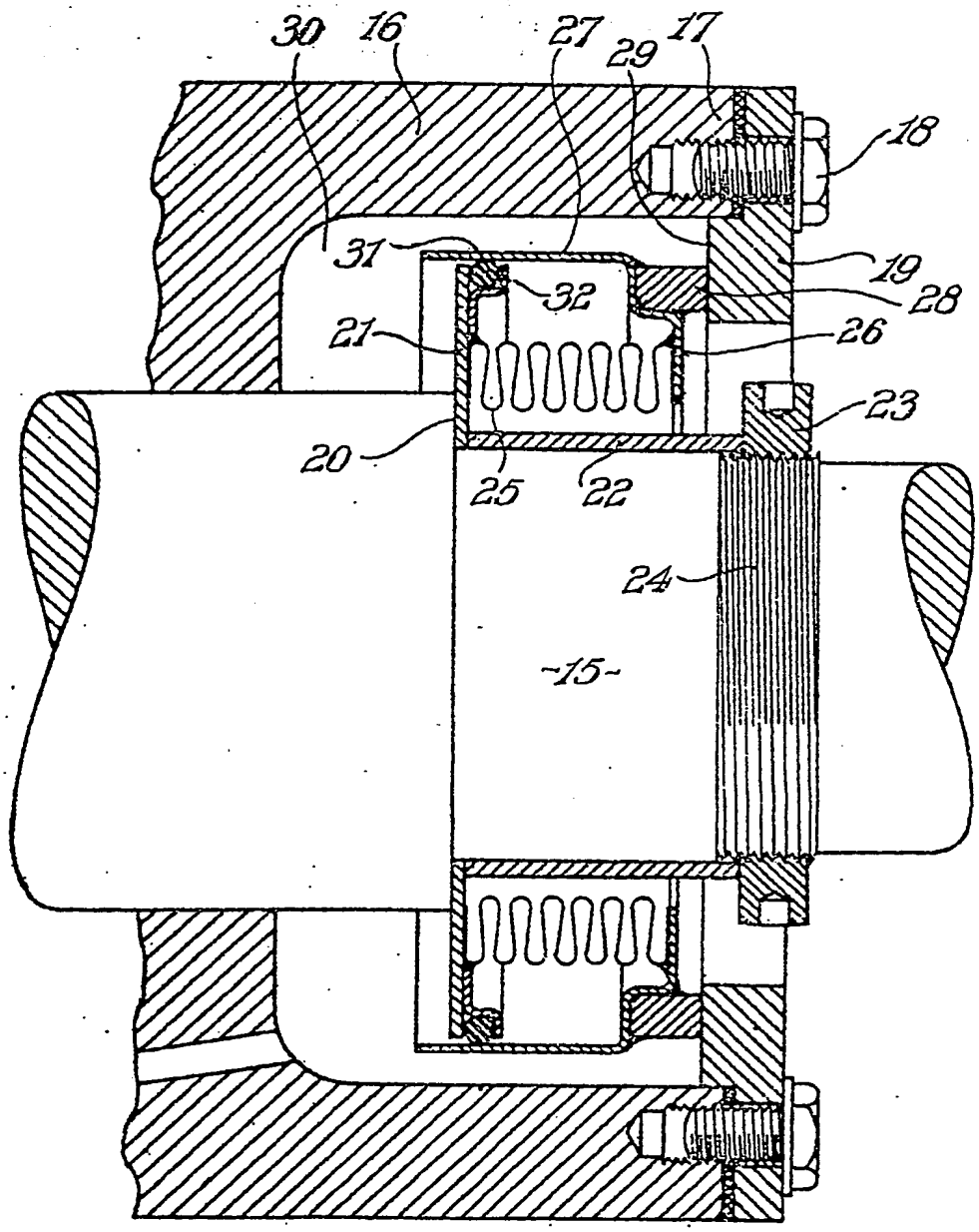

Fig. 2.

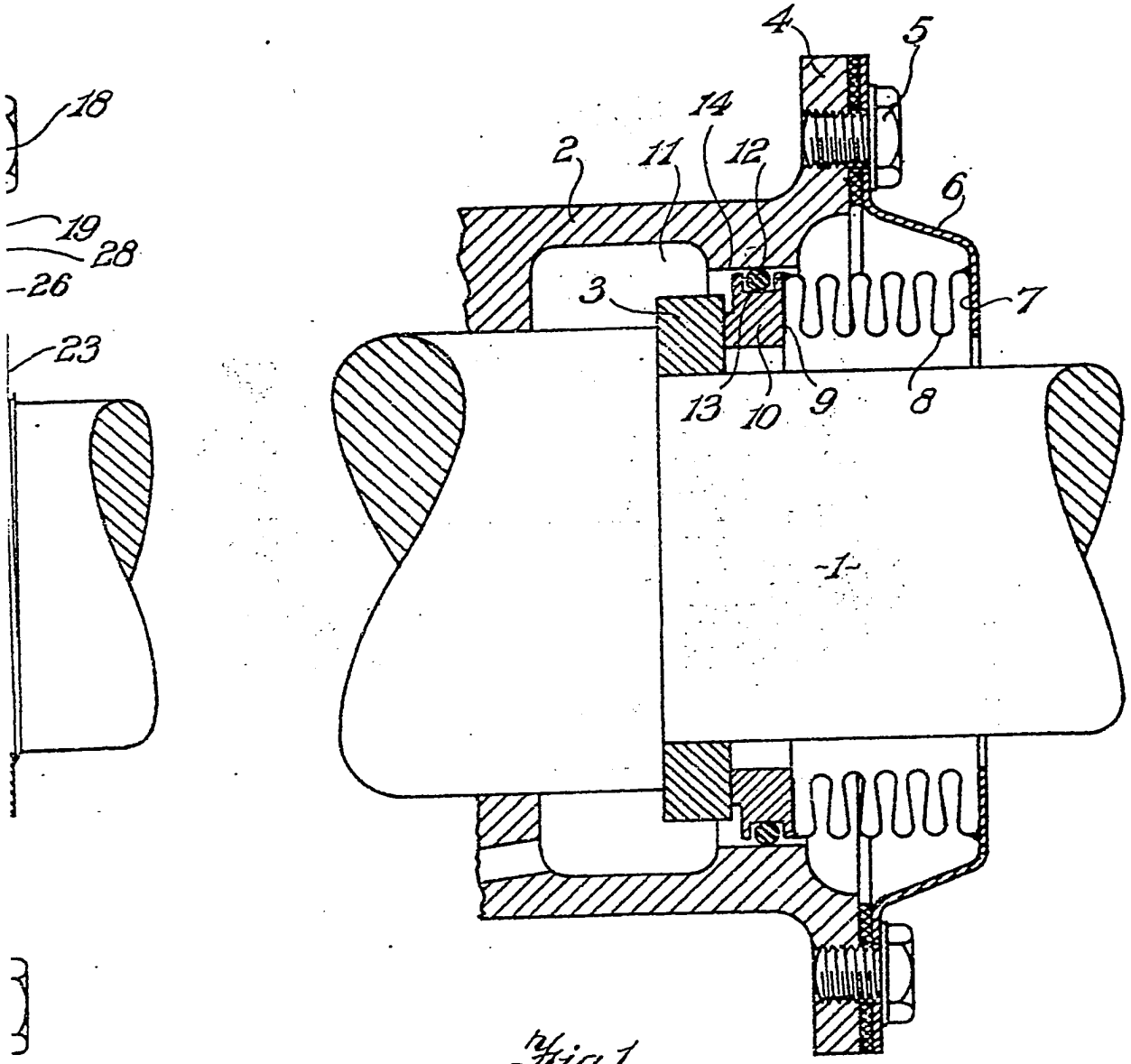

Fig. 1.

H.M.S.O. (Ty. P.)

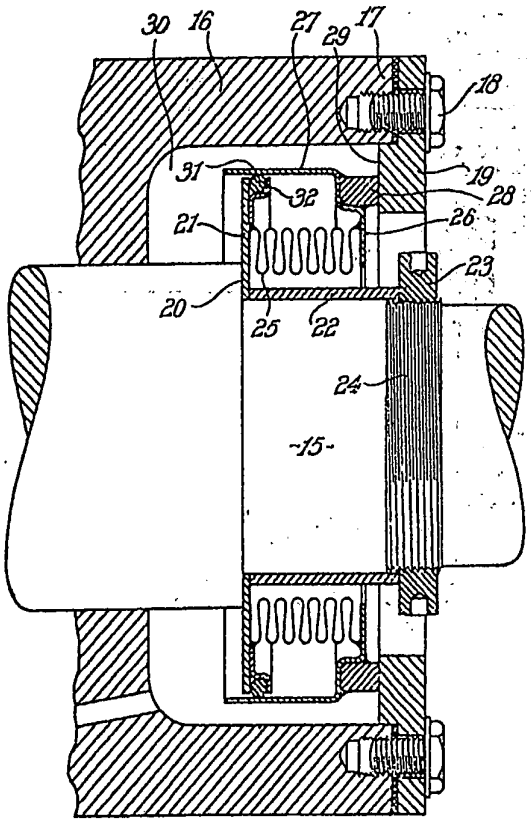

Fig. 2.

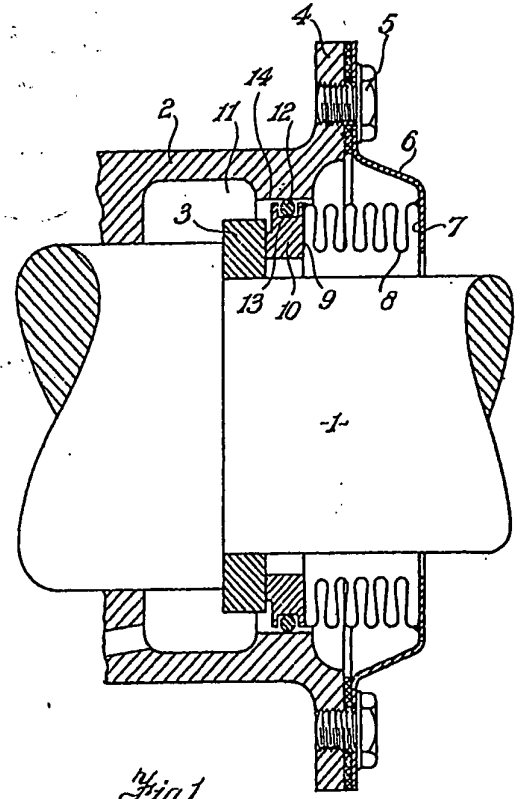

Fig. 1.

H.M.S.O. (Ty. P.)